POLYVITELLINE EGGS AND DOUBLE MONSTERS IN THE POND SNAIL LYMNÆA COLUMELLA SAY

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The occasional occurrence of gastropod eggs containing more than one embryo is more or less familiar to workers with these forms. Such embryos are normally separate; but occasionally conjoined twins are found, and more rarely triplets, and instances of as many as five conjoined embryos have been reported. The literature on this subject has been well reviewed by Pelseneer (1920) and Crabb (1931), so that no extended historical discussion seems necessary. Our purpose is merely to present certain material which seems to us useful in supplementing and perhaps in modifying the conclusions of other workers.

The material here presented consists of the total egg production throughout life of a population of (initially) 400 snails of the species *Lymnæa columella* Say. The wild parents of these snails were collected in two ponds in the vicinity of Baltimore, designated here as the Falls Road pond and the Boyce Avenue pond. In addition to these wild ancestors of known origin, two snails isolated from laboratory aquaria furnished eggs for this experiment; nothing is known concerning their origin. These animals were isolated in the laboratory in finger bowls with about 150 ml. of spring water, fed with leaf lettuce, and their eggs collected daily. The eggs so obtained were allowed to develop for about a week, at which time healthy-appearing clutches were selected for the experimental population. These eggs were removed from the capsule and placed in finger bowls with spring water. Each clutch of eggs provided twenty eggs, which were distributed among six finger bowls, one at density ten and five at density two per bowl. Leaf lettuce was used for food. Records of egg production were kept for each dish throughout the lives of the animals. Early in the experiment appreciable numbers of polyvitelline eggs appeared and were regularly entered in the records. Occasional double monsters were found; such eggs were saved and their development followed until the death of the embryos.

Table I summarizes the results obtained.

The facts regarding the production of polyvitelline eggs are summarized in Fig. 1. This chart shows the percentage of polyvitelline

eggs laid in each finger bowl in the experiment. The parentage of the snails in each finger bowl is also shown, together with the geographical origin of the parents.

It is clear from an examination of the chart that there are very marked differences in the proportions of polyvitelline eggs occurring in different finger bowls; and that there is clear indication that the offspring of wild parents from the Falls Road pond, especially those

TABLE I

Production of Polyvitelline Eggs by Offspring of Different Wild Parents

Wild ancestor	No. of dishes	No. of snails	Total eggs	Total polyvitelline eggs	Percentage polyvitelline eggs	Eggs having given number of vitelli							
						2	3	4	5	6	7	8	9 and over
1	5	8	3,570	58	1.62	47	9	2	—	—	—	—	—
2	17	42	34,199	1,453	4.25	1,079	272	63	15	4	8	3	9
4	16	35	37,761	1,631	4.32	1,166	324	89	20	13	6	5	8
6	2	2	3,031	146	4.82	103	36	4	1	1	1	—	—
8	12	22	9,857	144	1.46	110	23	4	3	2	1	—	1
Totals 1–8 Falls Road	52	109	88,418	3,432	3.88	2,505	664	162	39	20	16	8	18
12	12	23	14,508	96	0.66	85	8	2	—	1	—	—	—
15	6	14	9,647	81	0.84	65	12	—	1	—	—	3	—
16	12	29	17,672	244	1.38	220	17	1	3	1	1	—	1
17	5	10	7,359	106	1.44	83	14	4	1	3	—	—	1
Totals 12–17 Boyce Ave.	35	76	49,186	527	1.07	453	51	7	5	5	1	3	2
A2	7	10	13,411	227	1.69	209	8	3	3	1	—	—	3
A3	6	11	13,369	73	0.55	63	3	7	—	—	—	—	—

Notes: Column 1 shows the wild ancestor. Numbers 1 to 8 inclusive were taken from the Falls Road pond; numbers 12 to 17 from the Boyce Avenue pond. Numbers A2 and A3 were isolated from a laboratory aquarium culture; their wild origin is unknown.

from Nos. 2 and 4, laid a considerably higher proportion of polyvitelline eggs than those from the Boyce Avenue pond. There seems to be reason for supposing that these differences are the expression of some inherited character.

This conclusion differs from that of Crabb, who holds that there is no indication that the production of polyvitelline eggs is influenced by hereditary factors. The data given by the Crabbs (1927) seem to us, however, consistent with the notion that inheritance does play a

part in the phenomenon. Neither their data nor ours, however, are adequate to suggest any Mendelian mechanism.

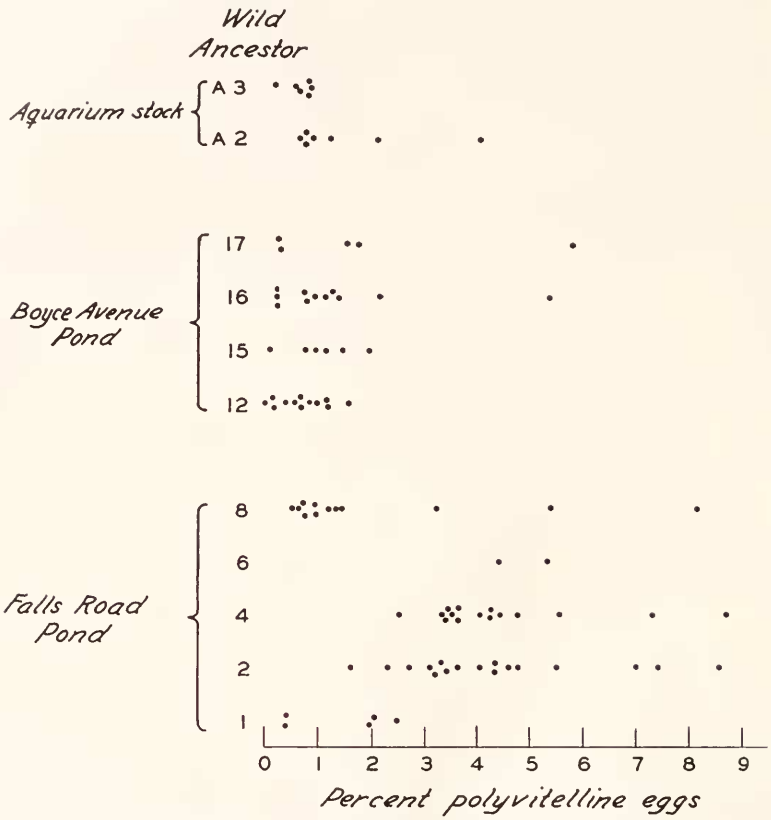


FIG. 1. Chart showing proportion of polyvitelline eggs in different finger bowls, segregated by ancestry.

A paper by Tur (1910) (not cited by Crabb) is of interest in this connection. He found, in *Philine aperta*, that there were distinct local races, some of which produced polyvitelline eggs with some frequency and regularity, while animals from other localities rarely or never laid such eggs.

EXPLANATION OF PLATE

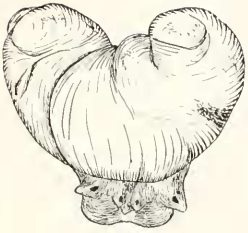
FIGS. 1–3. Lateral fusion with separate shells. Three views. Parent No. 27, grandparent No. 2.

FIGS. 4–5. Dorsal fusion with separate shells. Two views. Parent No. 7, grandparent No. 4.

FIG. 6. Visceral masses fused, single shell. Parent No. 12, grandparent No. 4.

FIGS. 7–8. Triple monster, shell fused. Parent No. 26, grandparent No. 2.

FIG. 9. Dorsal fusion, single shell. Parent No. 11, grandparent No. 4.



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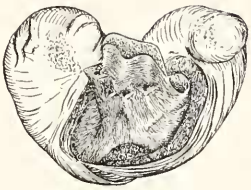

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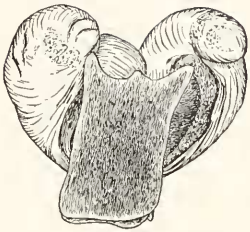

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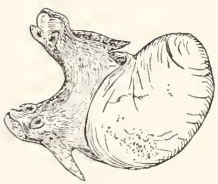

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Double Monsters

Double monsters in considerable numbers were observed in our material. Drawings of typical specimens (made for us by the laboratory artist, Mr. Arthur Johansen) are shown in Plate I. As regards the anatomical details of these monsters, we can add nothing of importance to Pelseneer's account. So far as our observations went, they agreed with his.

It will be noted that the wild ancestors giving rise to these double monsters came almost entirely from the Falls Road pond, as would be expected in view of their apparently certain origin through fusion of embryos. Actually, of 32 double and triple monsters, 28 (of which one was triple) had a Falls Road origin; one was derived from Boyce Avenue stock; and three (one triple) from laboratory stock of unknown origin.

Summary

Data are presented regarding the production of polyvitelline eggs and double monsters through the entire life of a group of *Lymnæa columella*. It is held that the data show that hereditary factors are concerned.

LITERATURE CITED

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Crabb, E. D., 1931. The Origin of Independent and of Conjoined Twins in Fresh Water Snails. *Roux' Arch. Entw. mech.*, **124**: 332.

Pelseneer, P., 1920. Les variations et leur hérédité chez les mollusques. *Mém. Ac. Roy. Belg., Cl. Sci.*, Coll. in—8°, **5**: 1 (pp. 308–339 deal with double monsters).

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Detailed bibliographies will be found in Crabb (1931) and Pelseneer (1920).